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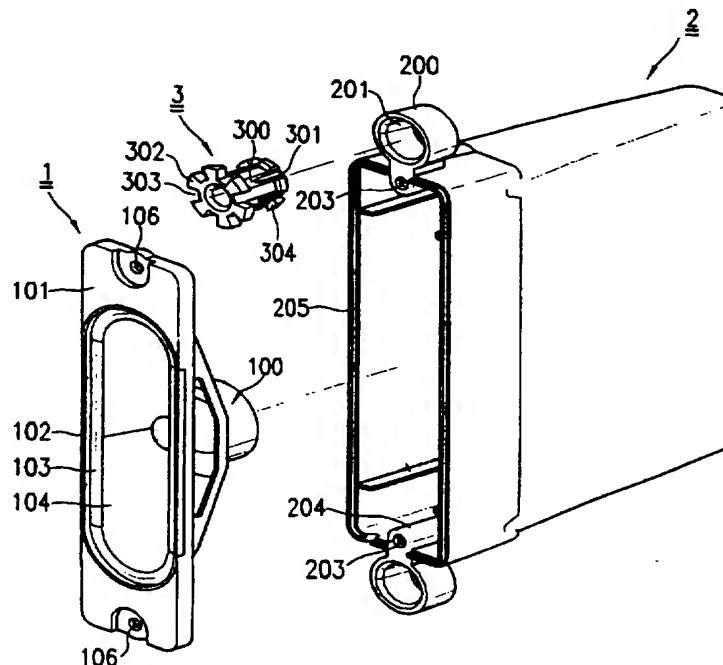
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United Kingdom

(54) Abstract Title

Display speaker system has integral cover/frame

(57) A speaker system for a display includes a cover frame integrated type speaker 1 having a cover frame 101 with screw holes 106 for assembly with a rear cover 2 at top and bottom thereof and a speaker 100 (for emitting sound) integrated with the cover frame 101. A rear cover 2 is fastened to a rear of the cover frame integrated type speaker 1, and a vibration attenuation member mounting unit 200 is provided on top and bottom thereof with vibration attenuation means disposed between the cover frame integrated type speaker 1 and the cabinet for attenuating a system vibration to prevent transmission of system vibration to the cabinet 4.

FIG.7A



GB 2 349 037 A

FIG.1
Related Art

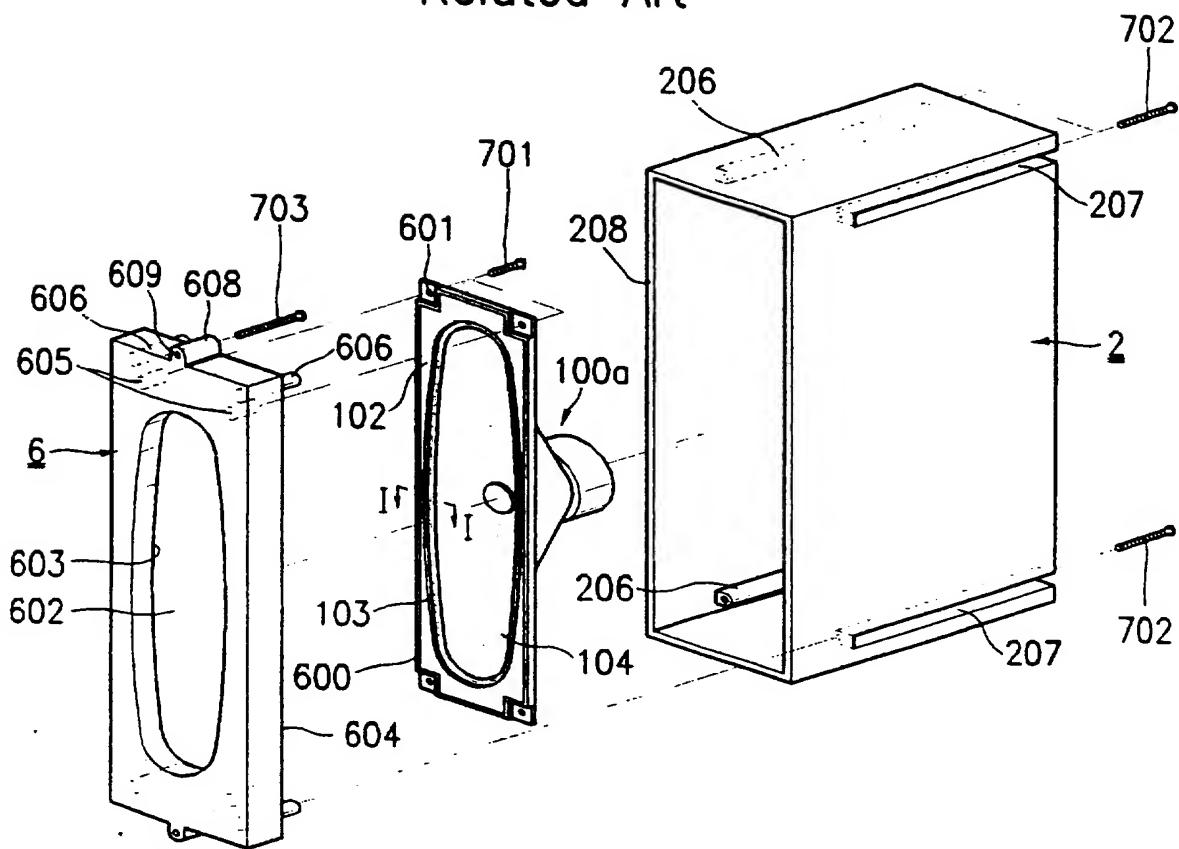


FIG.2
Related Art

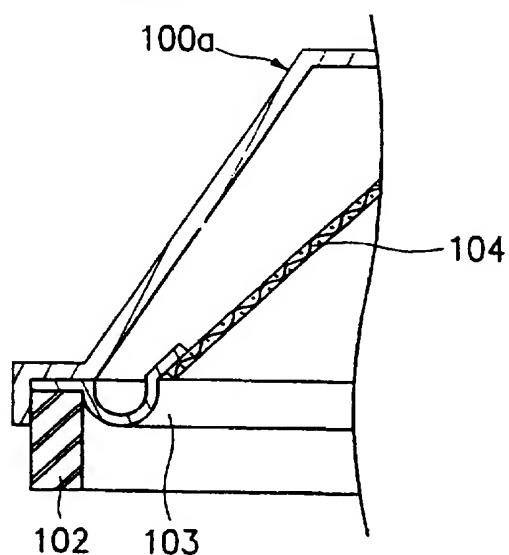


FIG.3
Related Art

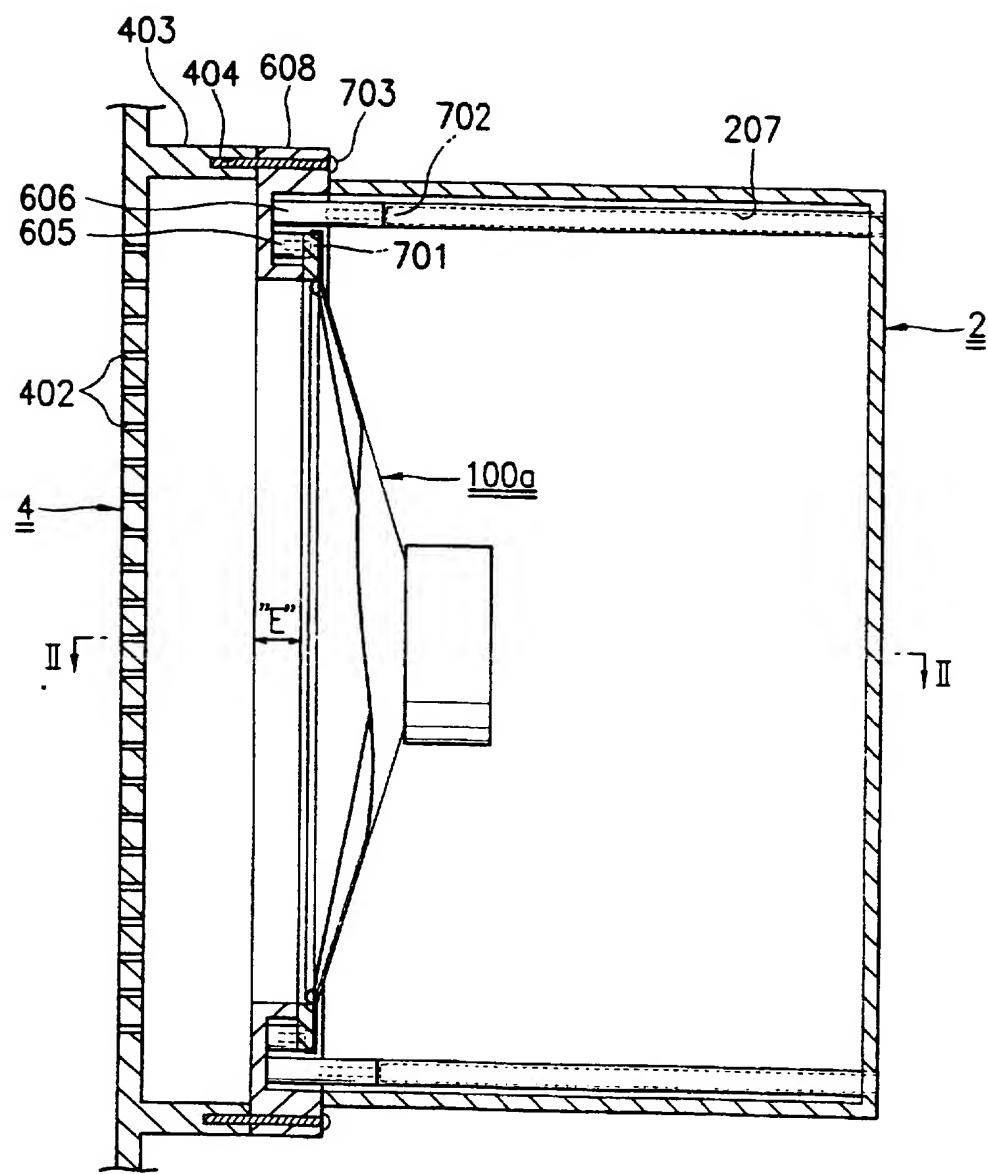


FIG.4
Related Art

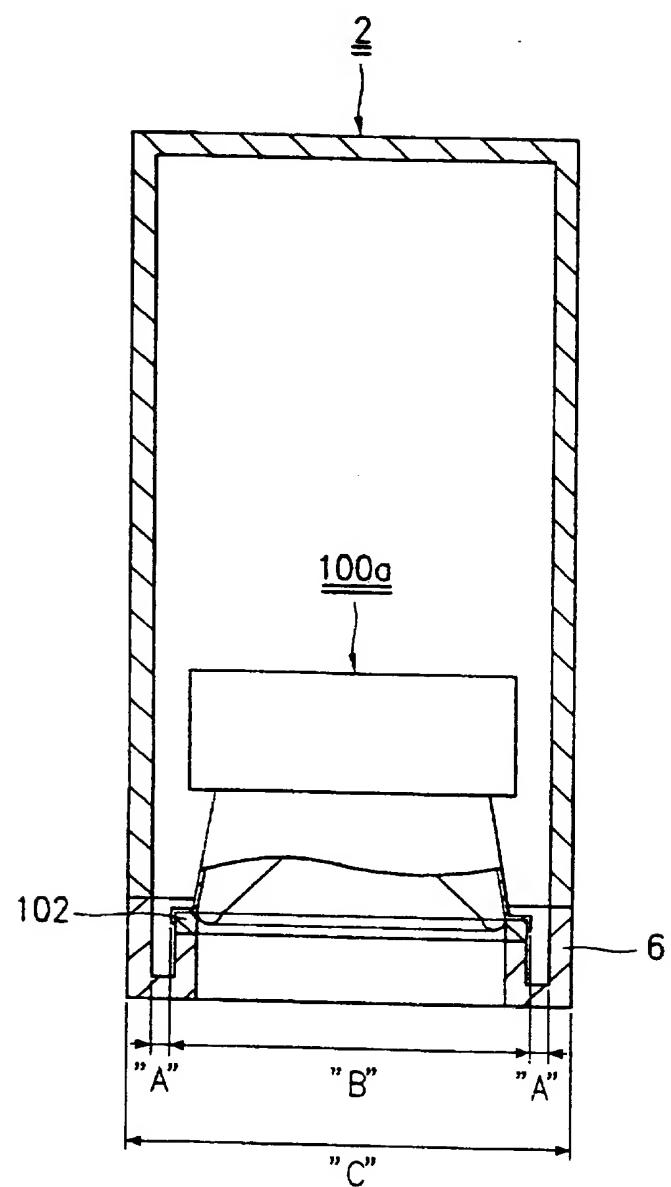


FIG.5
Related Art

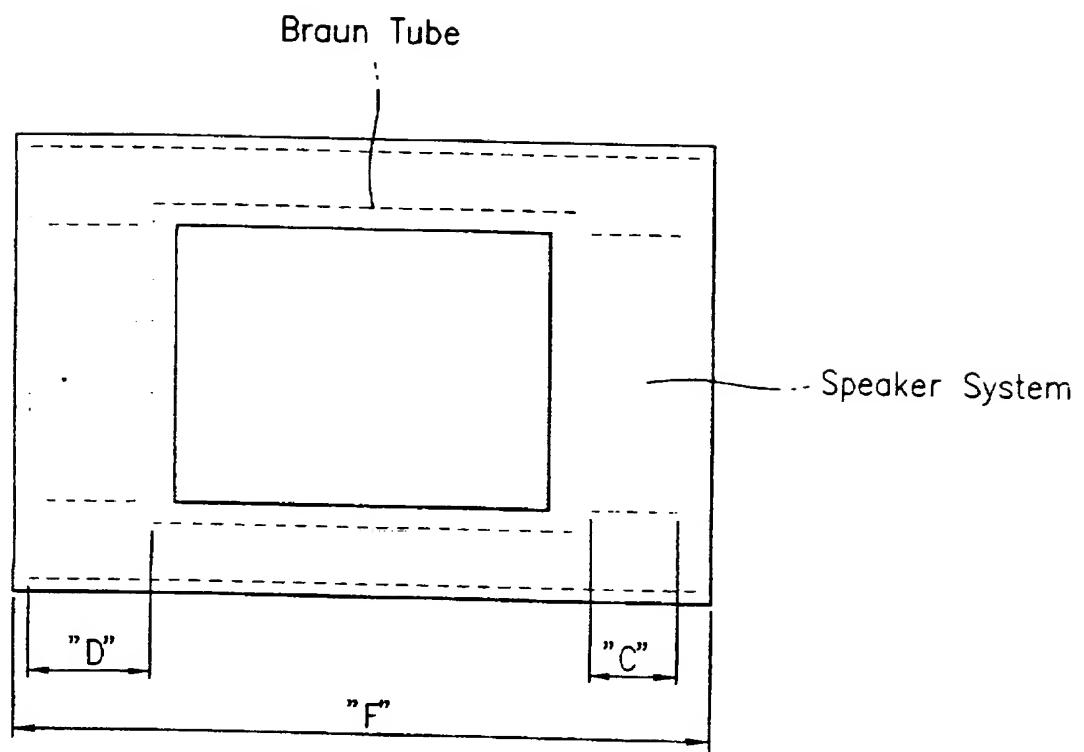


FIG.6

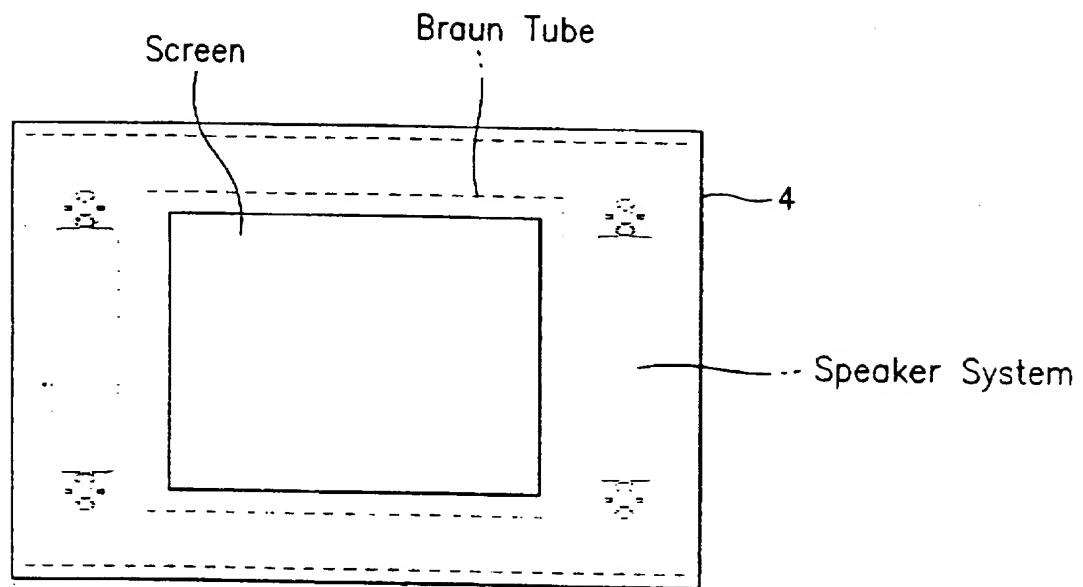


FIG.7A

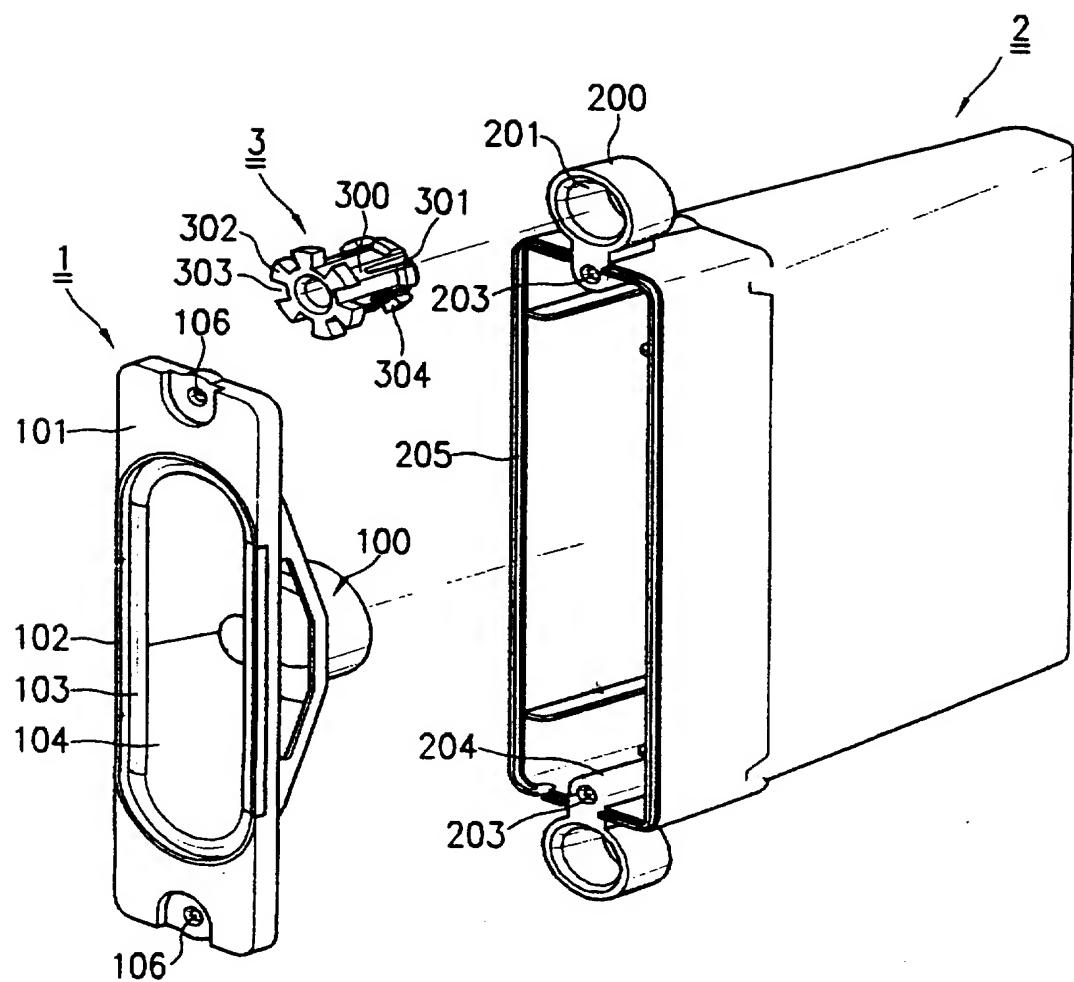


FIG.7B

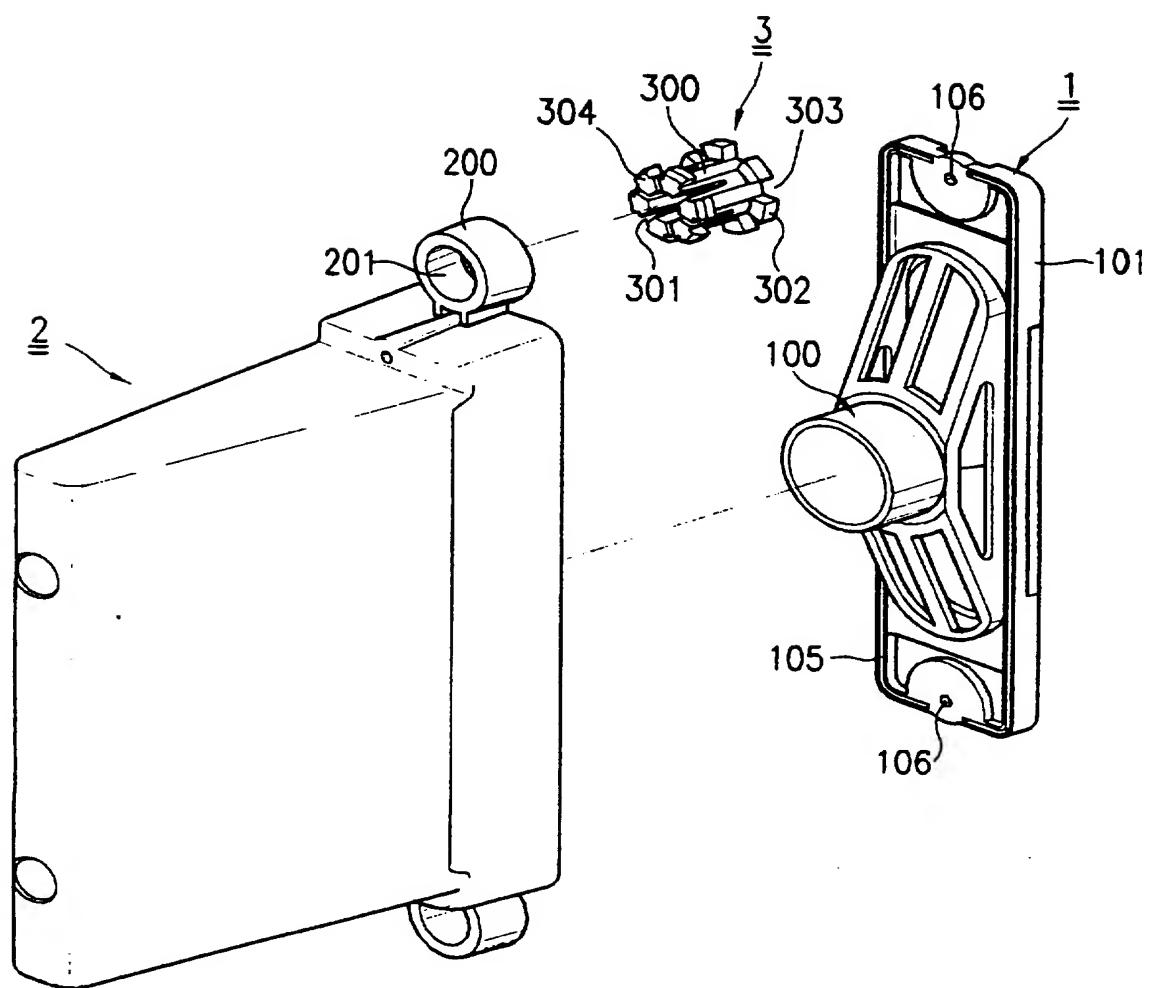


FIG.8

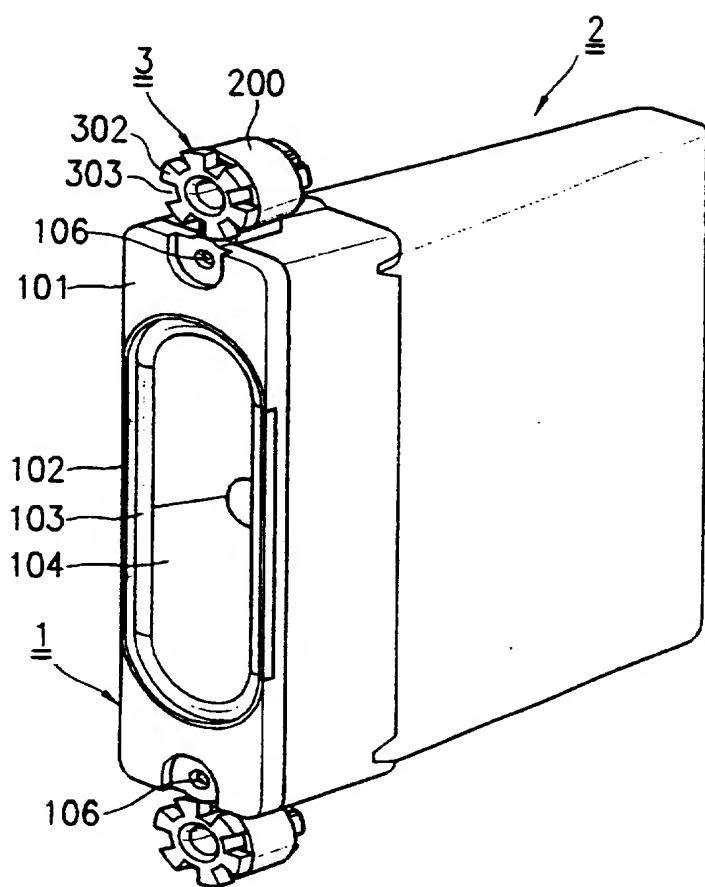


FIG.9A

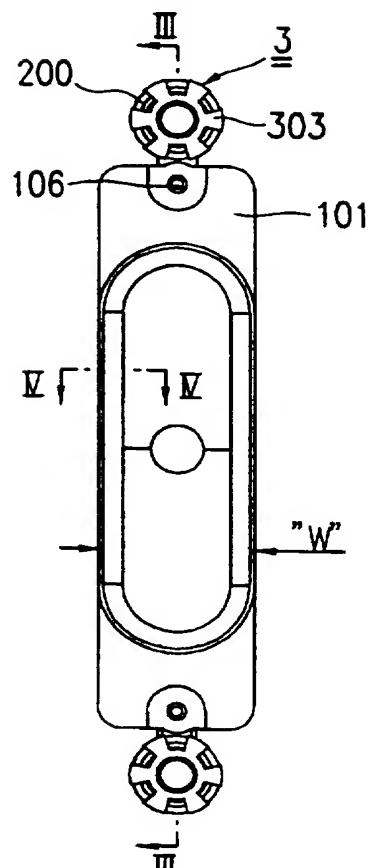


FIG.9B

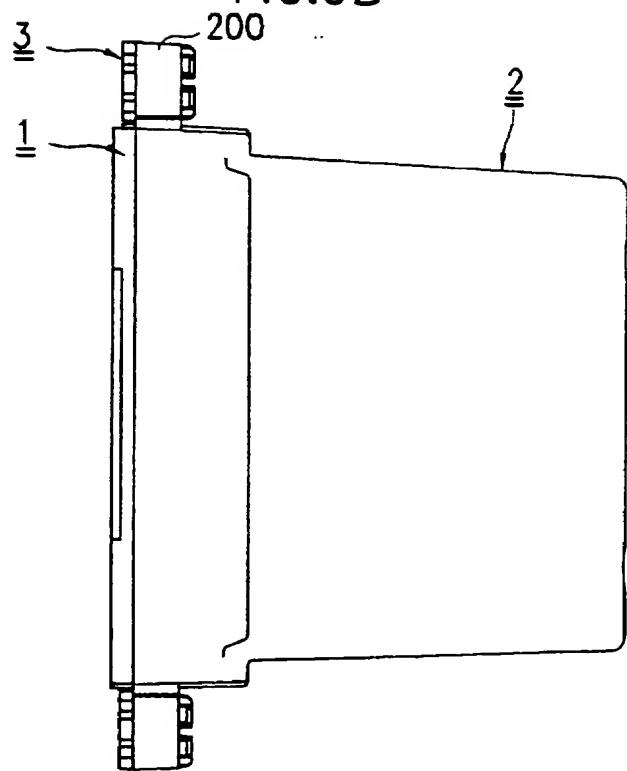


FIG.10

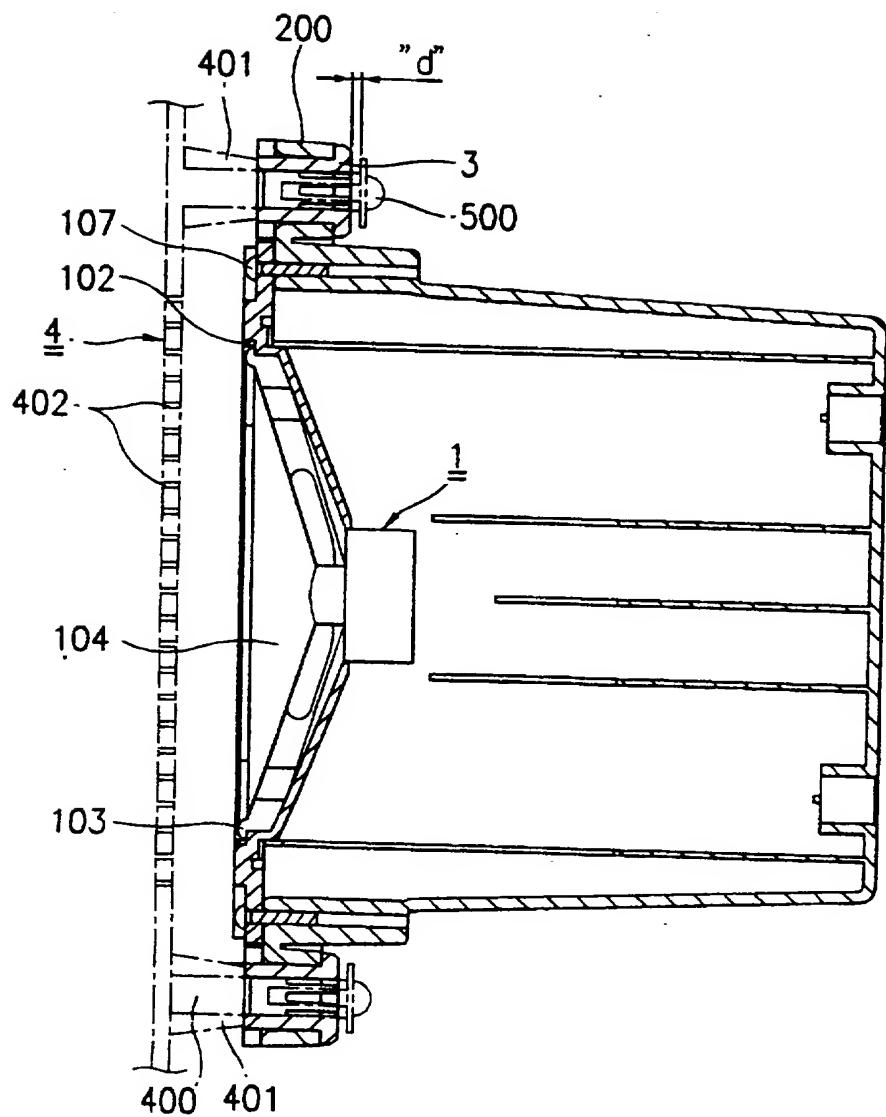


FIG.11

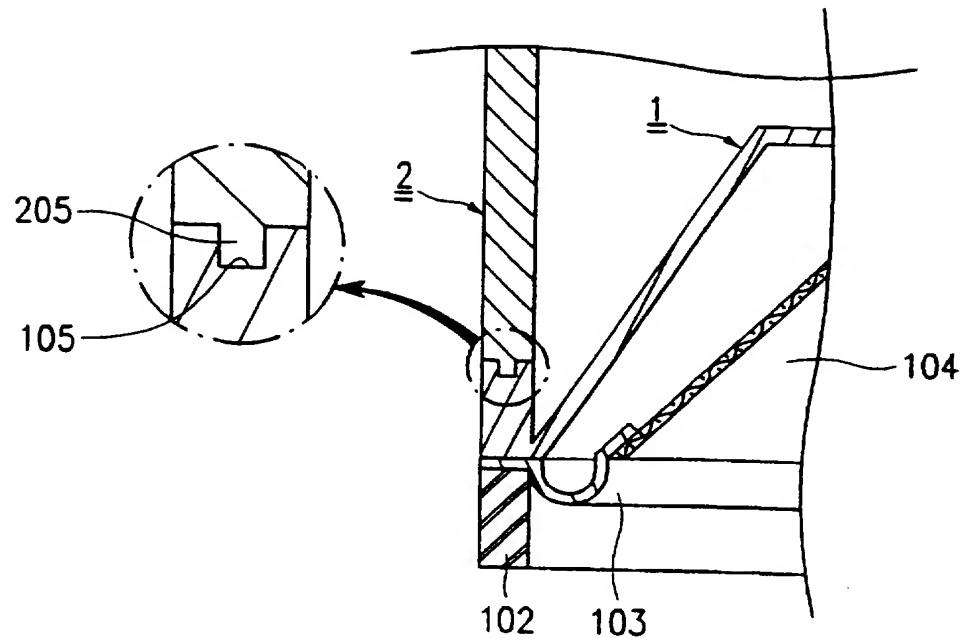


FIG.12A

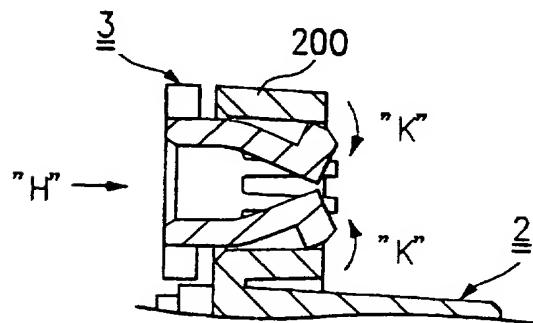


FIG.12B

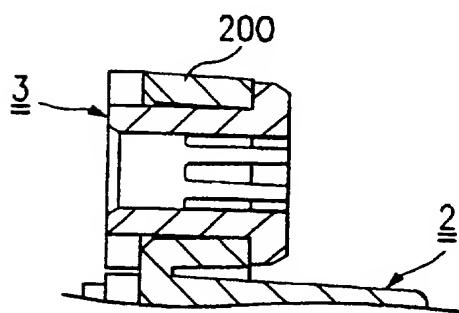


FIG. 13A

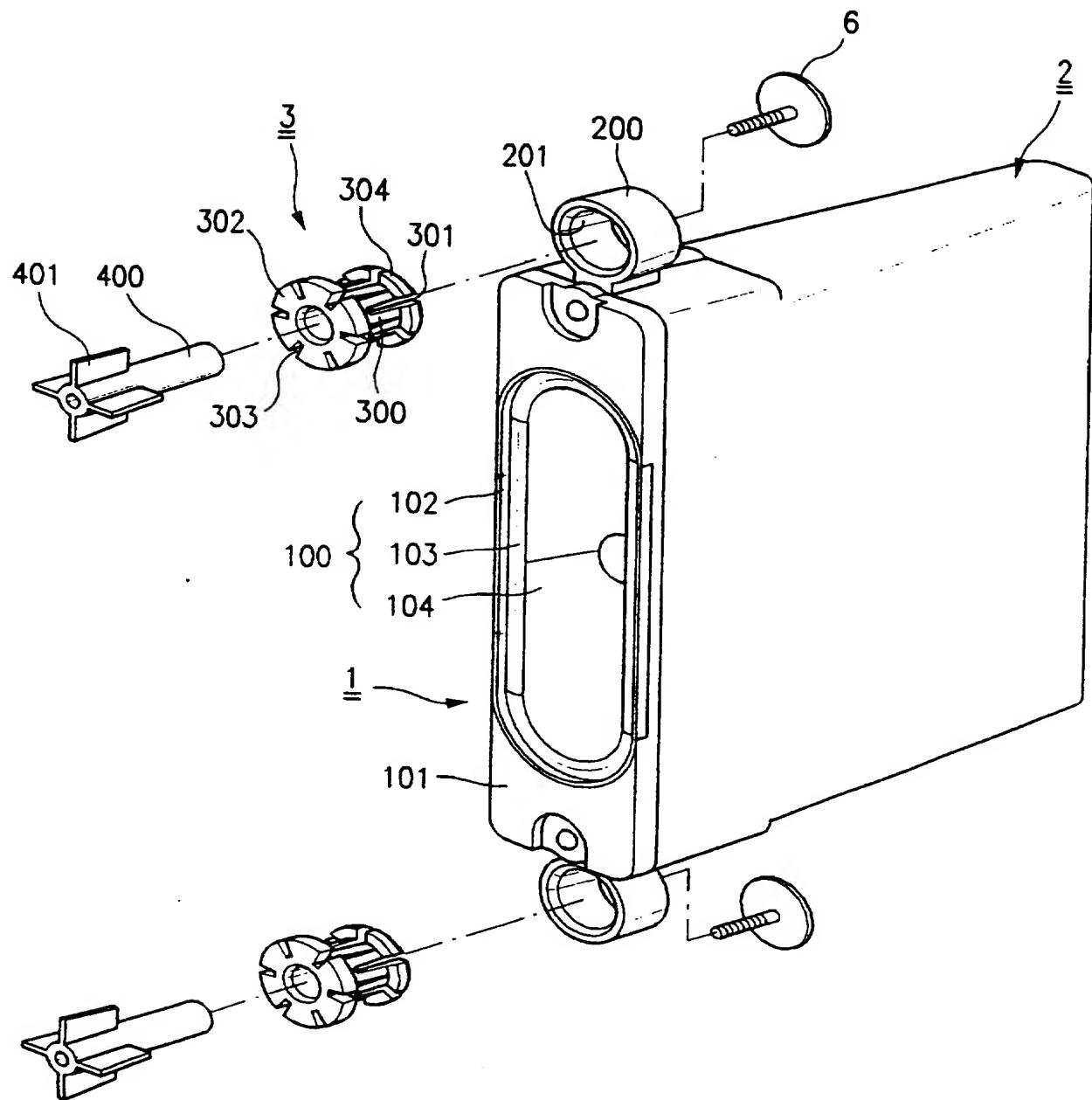
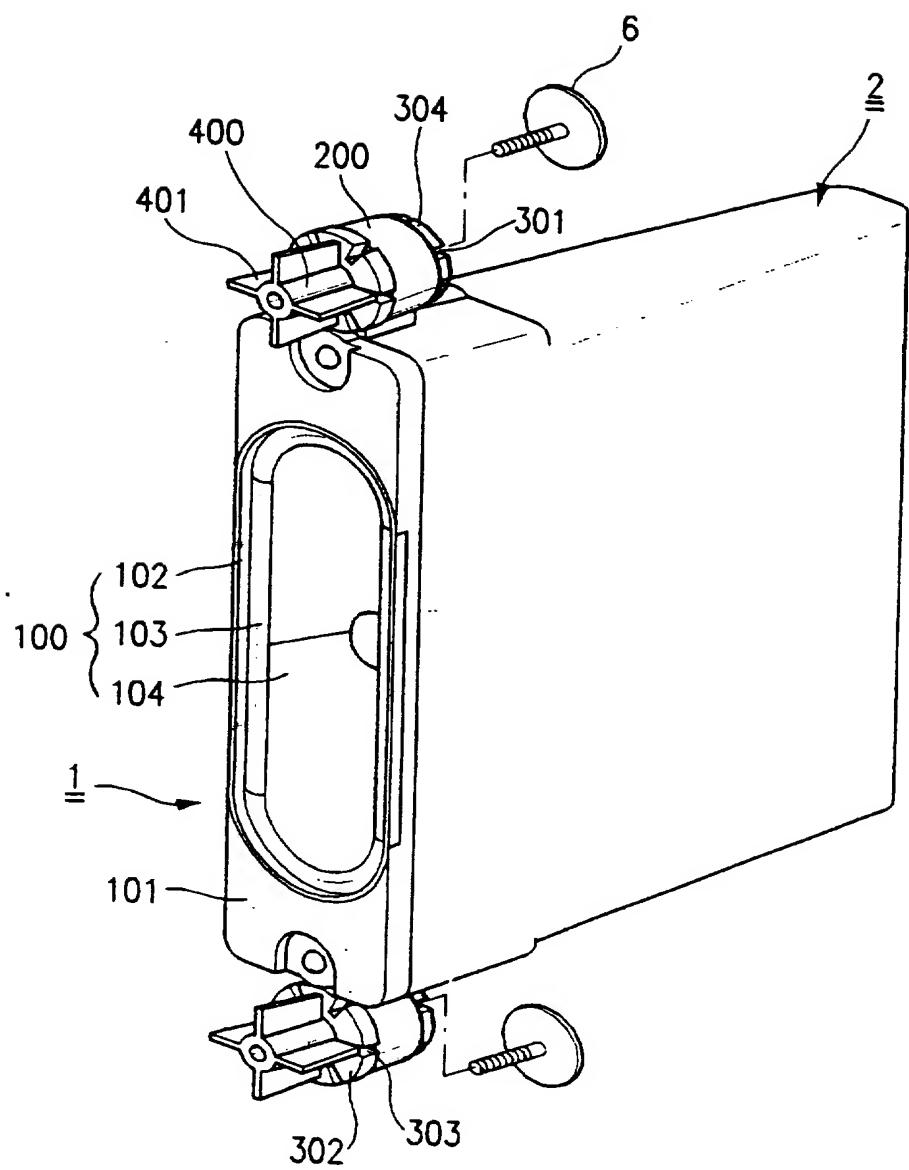


FIG.13B



SPEAKER SYSTEM FOR A DISPLAY

The present invention relates to a speaker system for a display, and more particularly, to a speaker system for a display of which the structure is modified for providing a high tone quality and reduced howling.

In general, a display, such as a computer monitor, with a built-in speaker system, includes the speaker system in a space between an outside wall of a Braun tube and an inside wall of a cabinet enclosing the Braun tube, a width of which is the width of the speaker system. The width of the speaker system is the short diameter of the speaker in the speaker system, and serves as a parameter for fixing a ratio of a long diameter of the speaker to the short diameter. The ratio of the long diameter to the short diameter of the speaker significantly influences the tonal quality of the speaker. A high tonal quality is achieved with a ratio of 1:1. That is, the closer a geometry of a gasket and cone paper of the speaker to a true circle, the higher the tonal quality.

FIGS. 1 to 5 illustrate a prior art speaker system for a display, such as the monitor for a personal computer. FIG. 25 1 illustrates a disassembled perspective view of the speaker system. FIG. 2 illustrates a section along line I-I in FIG. 1. FIG. 3 illustrates a section of the assembled speaker system in FIG. 1. FIG. 4 illustrates a section along line II-II of FIG. 3. FIG. 5 illustrates a 30 schematic front view.

Referring to FIGS. 1 and 2, a prior art track-type speaker systems for a display is provided with a track-type speaker 100a (called as "speaker" hereafter), a front

cover 6 mounted on a front face of the speaker 100a, and a rear cover 2 mounted on a rear face of the speaker 100a. The speaker 100a is provided with a frame 600, a gasket 102, an edge 103 fitted to an inside surface of the gasket 5 102 for forming a ring, and a paper cone 104 fitted to an inside surface of the edge 103. The frame 600 has a screw hole 601 at each corner. The front cover 6 is of rectangular form. It has an elliptical opening 602 in its central portion for passing a sound wave, a gasket fitting 10 surface 603 and a rear cover fitting surface 604, both at the rear face. There are bosses 605 (referred to as "speaker fastening boss" hereafter) each having a screw hole for a speaker fastening screw 701 and bosses 606 (referred to as "rear cover fastening boss" hereafter) 15 each having a screw hole for a rear cover fastening screw 702, both on an inside surface of a back of the front cover 6, and a portion 608 for a pass through hole on top and bottom of the front cover 6 for a screw 703 to be coupled to a screw hole 404 in a speaker system fastening 20 boss 403 on the cabinet 4. As shown in FIG. 1, the rear cover fitting surface 604 is formed further rear of the gasket fitting surface 603. The rear cover 2 has a form of an empty box for enhancing resonance and is provided with screw holes 206 for fastening to the rear cover 25 fastening bosses 606 formed on the front cover 606 and guide grooves 207 for guiding screws to the screw holes 206, on both sides thereof. The cabinet 4 including the speaker system with the speaker 100a, the front cover 6, and the rear cover 2 mounted thereon; is provided with a 30 plurality of sound wave discharge holes 402 for discharging the sound wave during operation of the speaker, and a boss 403 for fastening the speaker system for fastening an assembled speaker system to the cabinet 4 by screw fastening with the front cover 6 (see FIG. 3).

The process for assembling the prior art speaker will now be described.

5 The speaker fastening bosses 605 on the front cover 6 and the screw holes 601 at four corners of the frame 600 of the speaker 100a are first mated then the speaker fastening screws 701 are fastened through the screw fastening holes 601 for assembling the front cover 6 and 10 the speaker 100a together. A gasket contact surface 603 of the front cover 6 and the gasket 102 on the speaker 100a are therefore in close contact which prevents a loss of a sound directed forwards from leakage backwards. After 15 the front cover 6 and the speaker 100a are joined, the rear cover fastening screws 702 are fastened through the screw holes 206 for assembling the front cover 6 and the rear cover 2 together so that the rear cover fastening bosses 606 on the front cover 6 and the screw holes 206 in the rear cover 2 are matched. Then, the screws 703 are 20 screwed into the speaker system fastening bosses 403 through pass through holes 609 when the speaker system fastening bosses 403 on the cabinet 4 and the pass through holes 609 in the portions 608 for pass through holes in the front cover 6 are matched, for fastening the speaker 25 system on the cabinet 4.

However, the prior art speaker system applied for a display has the following problems.

30 The prior art speaker system for a display requires a complexly shaped front cover 6 with a plurality of bosses 605 and 606 as means for fastening the speaker 100a to the rear cover 2 which serves as a resonance box. The front cover 6 is always required as a means for mounting the

prior art speaker system to the cabinet 4, for providing the portions 608 for pass through holes on the front cover 6. Therefore, the prior art speaker system has the disadvantage that it requires many components which have 5 complicated shapes, are expensive and require the manufacture and assembly of the many components. The requirements for the complexly shaped front cover 6 in the prior art necessitates many components and fastening members in assembly of the many components. Therefore, 10 the prior art speaker system is expensive to manufacture, the components are difficult to fabricate and their fabrication and assembly is labor intensive. In particular, a gap ("A" in FIG. 4) required between an inside surface of the outside wall of the front cover 6 and the outside surface of the speaker 100a adds to the 15 cost of design and materials. That is, the gap ("A" in FIG. 4) between the inside surface of the outside wall of the front cover 6 and the outside surface of the speaker 100a is always required in assembly of the front cover 6 with the rear cover 2 to provide the rear cover fastening 20 bosses 606 for use in assembly of the rear cover 2 on an outside region of the speaker 100a. As the gap "A" should be secured between the inside surface of the outside wall of the front cover 6 and the outside surface of the speaker 100a, as explained above, a width ("C" in FIG. 4) 25 of the front cover 6 becomes larger than a width ("B" in FIG. 4) of a speaker frame 600. In detail, the width (the same as the width of the rear cover) of the front cover 6 is larger - up to twice the thickness of the front cover - 30 added to a value twice that of the gap "A" in FIG. 4, in comparison to a width of the frame 600. The speaker system must have gaps provided to the inside surface of the cabinet 4 and the outside surface of the Braun tube. Therefore, a gap ("D" in FIG. 5) between the inside

surface of the cabinet 4 and the outside surface of the Braun tube for placing the speaker system therein must also be the larger - up to the size of the gap ("A" in FIG. 4) between the inside surface of the outside wall of 5 the front cover 6 and the outside surface of the speaker 100a. As explained above, this affects to the design and cost of the speaker system.

10 The symbol "F" in FIG. 5 is a width of a monitor in the prior art speaker system. There is another problem with 15 the prior art speaker system for a display. Though it is designed so that the rear cover fitting surface 604 of the front cover 6 makes close contact with the front cover fitting surface 208 of the rear cover 2 to prevent the sound directed forwards being affected by leaked sound directed backwards, the imperfect sealing against this causes a loss of the sound intensity of the sound directed forwards. A perfect close contact between the rear cover fitting surface 604 of the front cover 6 and the front 20 cover fitting surface 208 of the rear cover 2 is difficult to achieve. When there is a leakage of the sound directed backwards there is the problem that the intensity of a sound directed forwards is interfered with by the sound directed backwards which has a phase opposite to the sound 25 directed forwards.

The prior art speaker system for a display also suffers from a further problem.

30 Referring to FIG. 3, the fastening of the front cover 6 at the sides of the speaker 100a in the prior art speaker system forms a sound wave conduit from the gasket to the front surface of the front cover 6, for the sound, emitted from the speaker 100a and directed forwards to pass

through when the speaker is in operation. The conduit causes a tunnel effect for sound directed forwards, which deteriorates the quality of the sound directed forwards from the speaker 100a. The tunnel effect is a phenomenon 5 in which a particular frequency of the sound is offset as the sound passes through the sound passage while another particular frequency of the sound is amplified which affects control of a desired sound quality. Moreover, the direct connection of the prior art speaker system to the 10 cabinet 4 (a rigid body) without attenuation of vibration by means of the screws (rigid bodies), causes direct transmission of system vibrations to the Braun tube when the speaker is in operation, resulting in serious flickering of the image on the display. That is, the 15 vibration transmitted to the Braun tube directly without attenuation causes resonance of a shadow mask fitted inside the Braun tube, that causes flickering of the image. This conflicts with the provision of a high powered speaker. Also, a low frequency band can not be 20 lowered further, which results in deterioration of sound quality because the image flickering is significant at a frequency below 200 Hz. This conflicts with the provision of a high quality speaker system built-in a display.

25 Accordingly, the present invention is directed to a speaker system for a display that at least alleviates one or more of the problems with the prior art.

30 The present invention is set out in the accompanying independent claims. Some preferred features are recited in the dependent claims.

An object of the present invention is to provide a speaker system for a display, in which the number of components is

reduced to reduce production costs and improve productivity in fabrication and assembly of components. A ratio of a short axis to a long axis of the speaker is made to be close to 1:1 for improving sound quality.

5

Another object of the present invention is to provide a speaker system for a display which can prevent a loss of sound intensity directed forwards caused by leakage of sound as well as deterioration of sound quality caused by 10 the tunnel effect.

10

A further object of the present invention is to provide a speaker system for a display which can prevent flickering of an image on the display caused by transmission of 15 vibrations to the cabinet from the speaker when the speaker is in operation.

Additional features and advantages will be set forth in the description which follows.

20

To achieve these and other advantages and in accordance with the purpose of the present invention, as embodied and broadly described, one embodiment of the present invention provides a speaker system for a display that includes a 25 cover frame integrated type speaker having a cover frame for assembly to a rear cover and a speaker for emission of a sound, the cover frame and the speaker being integrated; the rear cover being for fastening to a back side surface of the cover frame integrated type speaker.

30

In another embodiment, there is provided a speaker system for a display including a cover frame integrated type speaker having a cover frame for assembly with a rear cover and a speaker (for emitting sound) integrated with

the cover frame, a rear cover fastened to a rear of the cover frame integrated type speaker, and vibration attenuation means disposed between the cover frame integrated type speaker and the cabinet for attenuating a system vibration to prevent transmission of the system vibration to the cabinet.

5 The present invention can be put into practice in various ways some of which will now be described by way of example 10 with reference to the accompanying drawings, in which:

FIG. 1 illustrates a perspective disassembled view of a prior art speaker;

15 FIG. 2 illustrates a section along line I-I of FIG. 1;

FIG. 3 illustrates a section of the assembled speaker of FIG. 1;

15 FIG. 4 illustrates a section along line II-II of FIG. 3;

FIG. 5 illustrates a schematic front view;

20 FIG. 6 illustrates a schematic front view of a display showing a speaker system in accordance with an embodiment of the present invention mounted within the display;

25 FIG. 7A illustrates a perspective disassembled view showing the speaker system;

FIG. 7B illustrates a perspective disassembled view showing the speaker system from the back;

FIG. 8 illustrates a perspective assembled view showing the speaker system;

30 FIG. 9A illustrates a front view of the speaker system according to FIG. 8;

FIG. 9B illustrates a side view of the speaker system according to FIG. 8;

FIG. 10 illustrates a section across line III-III of

the speaker system according to FIG. 9A;

FIG. 11 illustrates a section across line IV-IV of the speaker system according to FIG. 9A;

FIGS. 12A and 12B illustrate the assembly process of 5 the vibration attenuation member according to FIG. 11; wherein,

FIG. 12A illustrates a section showing the vibration attenuation member being deformed elastically and inserted into a mounting hole, and

10 FIG. 12B illustrates a section showing the vibration attenuation member inserted in a mounting hole with the deformation restored;

FIG. 13A illustrates a perspective disassembled view 15 of a speaker system in accordance with a first embodiment being assembled to fastening bosses for mounting the speaker system mounted to the cabinet; and

FIG. 13B illustrates a perspective view of the assembly shown in FIG. 13A.

20 The speaker system for a display according to one embodiment includes a cover frame integrated type speaker 1 having a cover frame 101 with screw holes 106 for assembly with a rear cover 2 at the top and bottom thereof and a speaker 100 (for emitting sound) integrated with the 25 cover frame 101, and a box type rear cover 2 fastened to a rear of the cover frame integrated type speaker 1 having a vibration attenuation member mounting unit 200 of a hollow cylindrical form provided on the top and bottom thereof. A mounting hole 201 in the vibration attenuation member 30 mounting unit 200 is provided for mounting the cover frame integrated type speaker 1 and the rear cover 2 to the cabinet 4, and is provided with a vibration attenuation member 3 made of rubber or silicon which can attenuate a system vibration transmitted to the cabinet 4 from the

speaker. The speaker 100 has a track-formed gasket 102 with a short diameter of a size identical to a short side (width) of the cover frame 101, an edge 103 attached to an inner side of the gasket 102 to form a ring, and a cone 5 paper 104 attached to an inner side of the edge 103 in a cone form. There is a projection 204 under the vibration attenuation member mounting unit 200 on the rear cover 2 having a screw fastening hole 203 corresponding to the screw hole 106 each formed on the top and bottom of the 10 frame of the cover frame integrated type speaker 1. The gasket 102 for the cover frame integrated type speaker 1 is fitted flush with a front surface of the cover frame 101. There is a groove 105 formed in a rim in a back of the cover frame 101 of the cover frame integrated type 15 speaker 1, and there is a rib 205 on a surface of the rear cover for coupling with the cover frame 101, for tight connection between the rib 205 on the rear cover 2 with the groove 105 in the cover frame integrated type speaker 1 when the cover frame integrated type speaker 1 is 20 assembled with the rear cover 2, thereby preventing leakage of a sound directed backwards. The positions of the rib 205 and the groove 105 may be interchanged, and there may be a plurality of ribs 205 and the grooves 105 on the rear cover 2 and the cover frame 101 for assuring 25 prevention of the leakage of the sound directed backwards. That is, because a length of an escape path of the sound wave through the rib 205 and the groove 105 is dependent on geometry of the rib 205 and the groove 105, and the rib 205 cuts off the sound wave; if there is an appropriate 30 increase in the number of ribs 205 and the grooves 105 the sound wave blocking effect is increased. The vibration attenuation member 3 has a body 300 comprising a hollow cylinder form having a plurality of cut away slots 301 in a circumferential surface at one end, flange portions 302

formed in radial directions on the other end which has no slots 301 formed therein, and projections 304 formed in radial directions on the end with slots 301 in the body 301. When the vibration attenuation member 3 is assembled 5 with the vibration attenuation member mounting unit 200, the vibration attenuation member 3 has the body 300 brought into contact with an inner circumferential surface of the mounting hole 201 in the vibration attenuation member mounting unit 200, the flange portion 302 is 10 engaged by a front rim of the vibration attenuation member mounting unit 200, and the projections 304 formed on the other end of the body 300 in radial directions are engaged by a rear rim of the vibration attenuation member mounting unit 200, thereby preventing the vibration attenuation 15 member 3 from detaching from the vibration attenuation member mounting unit 200. There is a plurality of slots 303 formed in radial directions in the flange portion 302 of the vibration attenuation member 3 for reducing the contact area with the front rim of the vibration 20 attenuation member mounting unit 200, thereby reducing the vibration transmission area. The ends of the projections 304 of the vibration attenuation member 3 are chamfered for easy insertion of the projections 304 into the mounting hole 201 when the vibration attenuation member 3 25 is assembled with the vibration attenuation member mounting unit 200. There are speaker system mounting fastening bosses 400 (hereafter called "system mounting fastening boss") formed on a back surface of the cabinet 4 for fastening the rear cover 2 having the speaker 100 30 mounted thereon as the vibration attenuation member 3 is inserted and fastened with screws with washer 5, and there are positioning ribs 401 on an outer circumferential surface of the system mounting fastening boss 400 for limiting an insertion depth of the vibration attenuation

member 3 inserted onto an outer circumferential surface of the system mounting fastening boss 400. The distance from the positioning ribs 401 to the screw with washer 5 fastened to the system mounting fastening boss 400 is 5 greater than an axial length of the vibration attenuation member 3, and a diameter of the system mounting fastening boss 400 is sufficiently smaller than an inside diameter of the body 300 of the vibration attenuation member 3, so that the screw with washer 5 does not compress the 10 vibration attenuation member 3, and the speaker system having the vibration attenuation member 3 fitted therein is movable along an axial direction of the system mounting fastening boss 400.

15 The process of assembly and function of the speaker system for a display in accordance with a first embodiment will now be described.

20 The rib 205 (see FIG. 7A) is formed on a surface of the rear cover 2 to be coupled with the cover frame 101 into the groove 105 (see FIG. 7B) formed in a back rim of the cover frame 101 of the cover frame integrated type speaker 1, as shown in FIG. 11 illustrating a section across line 25 IV-IV in FIG. 9A. The rib 205 is inserted so that the cover frame integrated type speaker 1 and the rear cover are brought into close contact. Screws 107 are inserted into the screw fastening holes 203 in the rear cover 2 through the screw holes 106 in the cover frame 101, to assemble the cover frame integrated type speaker 1 and the 30 rear cover 2. The speaker system for a display in accordance with the first embodiment can prevent a loss of forwardly directed sound caused by a sound directed backwards due to the geometry of the rib 205 and the groove 105. Moreover, since the front cover in the prior

art speaker system can be omitted according to the first embodiment, together with the fastening members required for fastening the front cover and the speaker, the first embodiment speaker system significantly reduces costs and makes assembly more efficient. As shown in FIG. 12A, after the cover frame integrated type speaker 1 and the rear cover are assembled, upon pushing the vibration attenuation member 3 into the mounting hole 201 ("H" direction in FIG. 12A) in the mounting unit, the vibration attenuation member 3 can be inserted into the mounting hole 201 since the body 300 with the slots 301 are shrunk in a radial direction ("K" direction in FIG. 12B). The chamfered ends of the projections 304 help the insertion of the vibration attenuation member 3 into the vibration attenuation member mounting unit 200. As shown in FIG. 12B, after the body 300 of the vibration attenuation member 3 is inserted into the mounting hole 201 completely, the vibration attenuation member 3 returns to its original shape by the elastic restoration force of the material itself, to position the projections 304 at the other end of the body 300 having the slots 301 to the rear rim of the vibration attenuation member mounting unit 200, thereby preventing the vibration attenuation member 3 from falling off. That is, since the projections 304 at the other end of the body 300 having the slots 301 are caught by the rear rim of the vibration attenuation member mounting unit 200, the vibration attenuation member 3 is prevented from falling off in an axial direction. Then as shown in FIG. 10, after the body 300 of the vibration attenuation member 3 mounted to the speaker 100 is passed through the system mounting fastening boss 400 on the cabinet 4, a screw with washer 5 is screwed into the fastening boss 400. FIGS. 13A and 13B show the speaker system assembled. The depth of insertion of the vibration

attenuation member 3 is fixed by the positioning rib 401 formed on the outer circumferential surface of the system mounting fastening boss 400, and it is preferable that a length of the fastening boss 400 is designed to maintain a 5 gap as shown in "d" in FIG. 10 so that the screw with washer 5 does not press the vibration attenuation member 3. And, it is preferable that a diameter of the system mounting fastening boss 400 on the cabinet 4 is sufficiently smaller than an inside diameter of the body 10 300 of the vibration attenuation member 3 inserted onto an outer circumferential surface of the system mounting fastening boss 400, for permitting movement of the speaker system having the frame integrated type speaker 1 and the rear cover 2 along an axial direction of the boss between 15 the fastening boss 400 and the screw with washer 5 in a stroke of an amplitude as shown in "d" in FIG. 10.

Unlike the prior art speaker system in which vibration generated in the speaker 100 is transmitted to the cabinet 20 4 directly without attenuation caused by the direct connection of the speaker 100 to the cabinet 4 by means of the screw (a rigid body), the vibration generated in the speaker of the present invention is damped by vibration attenuation member 3, to significantly reduce the 25 vibration transmitted to the cabinet 4. The slots 301 and 303 formed in the body 300 and the flange portion 302 of the vibration attenuation member 3, respectively, in the present invention reduce the contact area between the body 300 of the vibration attenuation member and the system 30 mounting fastening boss 400 on the cabinet; the contact area between the flange portion 302 of the vibration attenuation member 3 and the positioning rib 401 on the outer circumference of the boss; the contact area between a front rim of the vibration attenuation member mounting

unit 200 and the flange portion of the vibration attenuation member 3; and the contact area between the rear rim of the vibration attenuation member mounting unit 200 and the projections 304 on the vibration attenuation member 3. The vibration transmitted to the cabinet 4 during operation of the speaker can therefore be effectively eliminated. That is, since the contact surface between the vibration attenuation member 3 and the vibration attenuation member mounting unit 200, and the contact surfaces between the vibration attenuation member 3 and the system mounting fastening boss 400 and the positioning rib 401 on the cabinet 4, act as vibration transmission surfaces which can be reduced by means of the slots 301 and 303; the vibration transmitted to the cabinet 4 can be reduced in proportion to an amount of reduction of the contact area. Accordingly, image flickering on a display can be effectively eliminated by cutting off the vibration transmission path according to material characteristics and geometry of the vibration attenuation member 3 together with the reduction of the vibration transmission area. The flange portion 302 of the vibration attenuation member 3 also serves to prevent direct contact of the positioning rib 401 with the vibration attenuation member mounting unit 200.

As can be seen from a comparison of FIG. 10 to FIG. 3, unlike the prior art, the elimination of the front cover can in turn eliminate the deterioration of sound quality caused by the tunnel effect present in the prior art, because there is no sound passage provided in front of the gasket 102.

The speaker system of the present invention also has the edge 103 and the gasket 102 adhered to the cover frame

with an adhesive, and a width of the gasket 102 is identical to a width ("W" in FIG. 9A) of the cover frame integrated type speaker 1. Therefore, when the width of the monitor is identical to a width ("F" in FIG. 5) of the monitor in the prior art speaker system, and a width of the front frame is identical to a width of the front frame in the part art, the short diameter of the speaker 100 which actually emits sound can be made significantly larger than the short diameter of the speaker 100 in the prior art speaker system. That is, the short diameter of the speaker 100 can be formed larger - over twice the width of "A" (a gap between an inside surface of an outside wall of the front cover and an outside surface of the speaker 100) in FIG. 4 of the prior art. This means that a ratio of the short diameter to the long diameter of the speaker system can be made close to 1:1. Therefore, the present invention gives rise to a better sound quality than the prior art speaker system.

The present speaker system for a display also has the following advantages.

Firstly, since the speaker system for a display of the present invention can save costs and improve productivity in assembly; it can prevent a loss of sound intensity directed forwards that is caused by a leaked sound directed backwards; and it can facilitate attenuation of system vibration in transmission from the speaker to the cabinet, so that a high quality and a low howling speaker is provided. That is, because the speaker system of the present invention requires no front cover that is a medium for fastening between the speaker 100 and the rear cover 2, the cost of the speaker system is reduced and the productivity in fabrication of components and assembly is

more efficient.

5 The elimination of the front cover in the speaker system permits use of the gap ("A" in FIG. 4) required between an inside surface of the outside wall of the front cover and the outside surface of the speaker 100 for providing a larger short diameter of the speaker 100, thereby maximizing the short diameter of the speaker 100, allowing a speaker system that produces better sound quality.

10

15 The perfect contact between the cover frame integrated type speaker 1 and the rear cover 2 in the speaker system of the present invention prevents loss of a sound intensity directed forwards as a result of sound leaked backwards; thereby improving the sound quality.

20

The elimination of the sound passage through which the sound directed forwards passes, which prevents the tunnel effect, prevents deterioration of the quality of sound that is directed forwards.

25

Moreover, the vibration attenuation means provided in the speaker system, which can effectively attenuate the vibration caused by the speaker 100, prevents image flickering due to the vibration of the speaker system, which enables the speaker to be used at a higher wattage, thereby improving sound quality.

30

It will be apparent to those skilled in the art that various modifications and variations can be made without departing from the scope of the invention. Thus, it is intended that the present invention cover modifications and variations of this invention provided they come within the scope of the appended claims.

Claims:

1. A speaker system for a display comprising: a speaker having an integral cover frame assembled to a rear cover, the rear cover being fastened to a rear surface of the speaker.
5
2. A speaker system as claimed in claim 1, wherein the cover frame includes screw holes for assembly with the rear cover, and the rear cover includes screw fastening holes at positions corresponding to the screw holes in the cover frame.
10
3. A speaker system as claimed in claim 1, wherein the speaker includes a peripheral gasket having a short diameter equal to the width of the cover frame.
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4. A speaker system as claimed in claim 1, wherein the gasket and the cover frame of the speaker are flush with one another.
20
5. A speaker system as claimed in claim 1, wherein the speaker includes a groove formed in a back surface of the cover frame, and the rear cover includes a rib formed on a surface which engages the groove in the cover frame, thereby preventing leakage of a sound backwards.
25
6. A speaker system as claimed in claim 5, wherein a plurality of the ribs and the grooves are provided for preventing leakage of the sound backwards.
30
7. A speaker system as claimed in claim 1, wherein a vibration attenuation member is fitted one each on top and

bottom of the rear cover by which the speaker and the rear cover are fastened to a cabinet, by which system vibration generated in the speaker is prevented from being transmitted to the cabinet.

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8. A speaker system as claimed in claim 7, wherein the vibration attenuation member mounting unit is of a hollow cylindrical form, provided on the top and the bottom of a front surface of the rear cover in which the vibration attenuation member is inserted.

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9. A speaker system as claimed in claim 7, wherein the vibration attenuation member includes:

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a hollow body having a plurality of slots formed in its circumference,

a flange portion formed at one end of the body, the one end having no slots in the body formed therein, and

projections extending in radial directions formed at the other end of the body, the other end having slots in the body.

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10. A speaker system as claimed in claim 9, wherein, when the vibration attenuation member is mounted to the vibration attenuation member mounting unit,

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the body of the vibration attenuation member is brought into contact with an inner circumferential surface of a mounting hole,

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the flange portion formed in radial directions at one end of the body of the vibration attenuation member is engaged by a front rim of the vibration attenuation member mounting unit, and

the projections formed in radial directions at the other end of the body are pushed into the mounting hole in the vibration attenuation member mounting unit completely,

such that the projections are engaged by a rear rim of the vibration attenuation member mounting unit, thereby preventing the vibration attenuation member from disengaging.

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11. A speaker system as claimed in claim 10, wherein the flange portion of the vibration attenuation member includes a plurality of slots formed in radial directions for reducing a contact area with a front rim of the vibration attenuation member mounting unit to reduce a vibration transmission area.

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15 12. A speaker system as claimed in claim 10, wherein the projections are chamfered for easy insertion into the mounting hole.

13. A speaker system as claimed in claim 11, wherein the vibration attenuation member is formed of an elastomeric material, for example, rubber or silicone.

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14. A speaker system as claimed in claim 7, including speaker system mounting fastening bosses formed on a back surface of the cabinet for fastening the rear cover, having the speaker fastened thereto as the vibration attenuation member is inserted, the rear cover being fastened to the cabinet using fastening members, and positioning ribs on an outer circumferential surface of the speaker system mounting fastening bosses for limiting an insertion depth of the vibration attenuation member inserted into an outer circumferential surface of the speaker system mounting fastening bosses.

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30 15. A speaker system as claimed in claim 14, wherein a distance from the positioning rib to a fastening member

fastened to the speaker system mounting fastening boss is greater than an axial length of the vibration attenuation member,

5 a diameter of the speaker system mounting fastening boss is formed sufficiently smaller than an inside diameter of the body of the vibration attenuation member inserted onto an outer circumferential surface of the speaker system mounting fastening boss, so that the fastening member does not compress the vibration
10 attenuation member, and the speaker and the rear cover both having the vibration attenuation member coupled thereto move along an axial direction of the speaker system mounting fastening boss.



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Claims searched: 1 to 15

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Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Other: Online: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	JP 100210580 A (FUNAI)	1
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A	JP 030292096 A (MATSUSHITA)	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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